

INITIAL DAMAGE ASSESSMENT CRITERIA AND PROCEDURES

Initial Damage Assessment Criteria and Procedures

for the City of Monterey, California

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Appendix Not Included. Please visit the Learning Resource Center on the Web at <http://www.lrc.dhs.gov/> to learn how to obtain this report in its entirety through Interlibrary Loan.

CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of others.

Signed _____
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Abstract

The problem is that the current Monterey City Disaster Plan is outdated and incomplete in scope as compared to the comprehensive all-hazard Emergency Operation Plans (EOP) recommended by the federal government. The purpose of this research project is to develop an EOP annex that describes criteria and procedural guidelines to establish an accurate and timely initial assessment of the geographic scope and severity of damages following a significant adverse natural or human-caused event within the City of Monterey.

A comprehensive literature review and action research methodology were used to answer the following research questions: (a) what standards or guidelines exist relative to disaster damage assessment; (b) what criteria/procedures are utilized by other communities to evaluate initial damage subsequent to an adverse event; (c) what are the most appropriate initial damage assessment criteria and procedures for Monterey; and (d) how can this information be best formatted, maintained, and communicated to assure effective utilization?

Results indicate there are no mandated standards for disaster damage assessment; however the American Red Cross and the Federal Emergency Management Agency have established comparable comprehensive guidelines and procedures. Effective damage assessment plans and procedures commonly include: (a) pre-assigned responsibilities; (b) specific time frame for completion; (c) pre-designated assessment areas; (d) specific elements of information to be collected; and (e) initial and recurrent training. Results further include an Initial Damage Assessment Plan that was subjected to stakeholder review and formally approved by the City Disaster Council for incorporation into the City's Emergency Response Plan and annual emergency management training plan.

Recommendations include expanding the scope of this research to develop a more comprehensive damage assessment plan that includes ongoing dynamic damage assessment throughout the entire response and recovery phases.

Table of Contents

Abstract	page 3
Table of Contents	page 5
Introduction	page 6
Background and Significance	page 7
Literature Review	page 10
Procedures	page 30
Results	page 33
Discussion	page 41
Recommendations	page 47
Reference List	page 49

Appendices

Appendix A: Initial Damage Assessment Plan	page 54
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Initial Damage Assessment Criteria and Procedures for the City of Monterey, California

Introduction

Monterey is a central California coastal city whose Fire Chief is designated by City Code as the Emergency Management Coordinator responsible for the development and maintenance of all emergency plans, management of the city Emergency Operations Center (EOC), and day-to-day management of emergency coordination efforts. The city's current Disaster Plan is limited in scope to an EOC organization and activation guide, and has not been revised since its initial adoption in 1997. The problem this presents is that the current Plan is outdated and incomplete in scope compared to a comprehensive all-hazard Emergency Operation Plan (EOP) as currently recommended by the federal government. The current plan also lacks criteria and procedures for assessing the scope and extent of damage to the community immediately following a significant adverse natural or human-caused event. This information is essential to determine status of critical infrastructure, establish strategic response priorities, facilitate effective allocation of resources, establish eligibility for state and/or federal assistance, and to provide timely information to the community and media. The Monterey Fire Department established revision of the current City Disaster Plan into a comprehensive all-risk Emergency Operations Plan as a strategic goal and priority for 2009.

The purpose of this research project is to develop a functional annex to the City's revised EOP that establishes criteria and procedures to assure accurate and timely initial assessment and communication of damage immediately following a significant adverse natural or human-caused event. A comprehensive literature review and action research methodology were used to answer the following research questions: (a) what standards or guidelines exist relative to disaster

damage assessment; (b) what criteria/procedures are utilized by other communities to evaluate initial damage subsequent to an adverse event; (c) what are the most appropriate initial damage assessment criteria and procedures for Monterey; and (d) how is this information best formatted, communicated, and maintained, to assure maximal value and effective utilization?

Background and Significance

The City of Monterey is a 10.2 square mile central California coastal community of 30,161 residents (Regional Analysis and Planning Services, 2007) with origins dating back as far as the 18th century. It is also the second largest incorporated city within Monterey County. Four undergraduate and postgraduate educational facilities, including Monterey Peninsula College, the United States Navy Postgraduate School, the United States Department of Defense Foreign Language Institute, and the Monterey Institute of International Studies, are located within Monterey. These educational facilities, together with Monterey's business and leisure tourism industry, increase the average daily population of Monterey to approximately 65,000 (Monterey Institute of International Studies, 2008; Monterey Peninsula College, n.d.; Naval Postgraduate School, 2005; D. Rhoads, personal communication, March 16, 2007; U.S. Army, n.d.).

Monterey's rich cultural history includes its designation as a Presidio by Spanish explorer Captain Gaspar de Portola and the establishment of Mission San Carlos by Father Junipero Serra in 1770 (City of Monterey, 2009). It is also the home of Colton Hall, where the first California State Constitution was written and signed in 1849. Colton Hall is one of over 50 buildings within Monterey with designated historic significance, many of which are open to the public and constitute a significant element of Monterey's tourism industry.

Monterey's economy is influenced primarily by business and leisure tourism. The city hotel occupancy tax is the largest revenue source (27 percent) of the city's \$55.6 million general fund budget (D. Rhoads, personal communication, February 24, 2009). Sales tax revenue accounts for another 14 percent (\$7.8 million) of the annual general fund budget. There are approximately 5,000 hotel rooms in Monterey, and the city owns and operates a 58,000 square foot conference center adjacent to the city's popular Fisherman's Wharf.

The Monterey fire department is a 67-employee paid career organization providing urban, wildland, and marine fire suppression, Basic Life Support (BLS) Emergency Medical Services (EMS), hazardous material release (Hazmat), technical rescue, fire prevention, fire code enforcement, fire origin and cause investigation, disaster preparedness, and community education services. The department responds to approximately 6,500 incidents annually with a daily staffing of 16 personnel operating from four stations (Monterey Fire Department, 2009; A. Miller, personal communication, May 22, 2009). The department has automatic mutual aid agreements with the adjoining city of Seaside, the Monterey Peninsula Airport, and the Pebble Beach Community Services District. Monterey provides contract fire protection services to the cities of Pacific Grove and Sand City, the Presidio of Monterey Defense Foreign Language Institute, and the Naval Postgraduate School housing community. The department administers and supports an active Community Emergency Response Training (CERT) program in 16 established neighborhood districts encompassing approximately 75 percent of the City's geographic area. The CERT program has trained over 750 volunteers, and currently has approximately 100 active community participants (R. Reed, personal communication, December 14, 2009). A CERT Advisory Committee, comprised of a Fire Department liaison, City Volunteer Coordinator, and one representative from each of the designated neighborhood district CERT teams, has been established to: (a) recommend goals and objectives for the CERT

program; (b) plan and review proposed CERT training and exercises; and (c) make other recommendations that support the CERT program.

Throughout its history, Monterey has experienced significant adverse events resulting in loss of life and significant property loss or damage, including large structure fires, earthquakes, and severe winter storms. The Monterey County Multi-Jurisdictional Hazard Mitigation Plan, developed jointly in 2007 by Monterey County and ten local cities including Monterey, identifies the following nine specific risks for the City of Monterey: (a) coastal erosion, (b) dam failure, (c) earthquake, (d) flood, (e) hazardous substance release, (f) landslide, (g) tsunami, (h) wildland fire, and (i) windstorm. This plan further quantifies the probability of occurrence for each hazard as well as the population and number of buildings and their valuation at risk for each hazard. The report concludes that Monterey is most vulnerable to earthquake, hazardous substance release, and wildland fire risks with a preponderance of the city's population and buildings vulnerable to those specific hazards (Monterey County, 2007).

Monterey City Code establishes the Fire Chief as the City Emergency Management Coordinator responsible for the development and maintenance of all emergency plans, management of the city Emergency Operations Center (EOC), and day-to-day management of emergency coordination efforts. The City Code also establishes an eight-member Disaster Council consisting of the City Manager, Assistant City Manager, Fire Chief, Police Chief, Planning and Public Works Director, Public Facilities Director, Library Director, and Recreation and Community Services Director. The Disaster Council is responsible for making policy recommendations regarding the Emergency Operations Center, emergency and disaster response plans, mutual aid plans and agreements, operational guides, policies, rules and regulations, and any procedural requirements necessary for the implementation and maintenance of such facilities and documents.

This project is significant in that it will provide data necessary to develop a functional Annex to the City's revised comprehensive Emergency Operations Plan that describes criteria and procedural guidelines to establish an accurate and timely initial assessment of the geographic scope and severity of damages following a significant adverse natural or human-caused event within the City of Monterey. This level of assessment is critical to City emergency management officials early in the response phase to provide sufficient information to establish strategic response priorities, facilitate effective allocation of available resources, determine eligibility for a local and/or regional emergency declaration, and to provide timely community and media information.

This project relates to the goal and objective of the Executive Fire Officer Program Executive Leadership course to develop the ability to conceptualize and employ the key processes and interpersonal skills used by effective executive-level managers. The problem this research seeks to answer is related to and supports the following United States Fire Administration (USFA) operational objectives: (a) improve local planning and preparedness, (b) improve the fire and emergency services' capability for response to and recovery from all hazards; and (c) improve the fire and emergency services' professional status.

Literature Review

The federal government has established a goal to develop, in partnership with state and local governments, a national emergency management system that is comprehensive, risk-based, and all-hazards in approach. Critical to this system are emergency operations plans (EOP) that describe who will do what, as well as when, with what resources, and by what authority, before,

during, and immediately after an emergency event (Federal Emergency Management Agency, 1996).

Contemporary disaster management authorities recognize four common and interrelated principles for effective management of emergencies and disasters: mitigation, preparedness, response, and recovery (Gordon, 2002). Effective emergency management involves a systematic approach treating each principle phase as part of a comprehensive process, with each phase building on the accomplishments of the preceding one with the overall goal of minimizing the impacts caused by an adverse event (Federal Emergency Management Agency, 1996).

The preparedness phase of comprehensive emergency management includes those activities most people associate with emergency planning (Gordon, 2002). The preparedness phase includes development of specific, pre-event plans that trigger specific actions when an emergency event occurs or as initiated by a designated official. Pre-event plans include procedures, checklists, contact information, locations, and resource inventories and directories that assist emergency management staff in carrying out critical steps in an appropriate order to ensure that no critical element is overlooked or missed. Anticipating the needs of the local community to address and respond to a variety of potential hazards takes great effort and time to ensure it is all-inclusive. While there are a number of philosophies regarding the structure of preparedness plans, Gordon (2002) suggests that most successful models are modular in structure, focusing first on the core aspects and adding increasing levels of detail over time.

The response phase includes those activities occurring after the onset of the emergency event to (a) protect the population, (b) limit damage from the primary event, and (c) minimize damage from any secondary events. Emergency response activities include securing the event area, evacuating threatened areas, conducting search and rescue operations for injured persons, providing emergency medical care, and sheltering evacuees and other victims. During the

response phase, emergency managers must constantly assess damage, coordinate personnel and equipment, and assign resources appropriately to stabilize the event. The response phase ends when the situation is stabilized and the immediate threat to life and property is abated (Lindell, Perry, & Prater, 2007).

The recovery phase includes efforts to restore the infrastructure and the social and economic life of a community back to a normalized, pre-event state. For the short term, recovery may include restoring essential lifeline systems (essential utilities, communication, and transportation) to an acceptable level while providing for basic human needs (food, clothing, shelter) and ensuring that the social needs of individuals and the community are met (e.g. maintaining civil obedience, crisis counseling). Once some level of stability is achieved, the community can begin recovery efforts that focus on longer-term objectives, such as restoring economic activity and rebuilding community facilities and housing with attention to long-term mitigation needs (Federal Emergency Management Agency, 1996).

To facilitate achievement of the goal to develop an integrated national emergency management system, FEMA has developed guidelines to assist state and local jurisdictions in developing and implementing comprehensive risk-based, all-hazard EOPs. These guidelines encourage emergency managers to address all of the hazards that threaten their jurisdiction in a single plan instead of relying on stand-alone plans (Federal Emergency Management Agency, 1996). Gordon (2002) posits that emergency plans should be “sufficiently comprehensive and flexible so as to be applicable and useful for the entire spectrum of potential emergency scenarios, from those experienced by a community on a daily basis to the large-scale disaster.” He also recommends that the basic plan framework be supplemented with detailed plans that address specific hazards or emergency management issues.

FEMA guidelines identify three separate elements of a comprehensive EOP: (a) the basic plan, which incorporates separate sections specific to introductory material, the plan purpose, situation and assumptions, concept of operations, organization and assignment of responsibilities, administration and logistics, plan development and maintenance, and authorities and references; (b) a functional annex element incorporating separate sections specific to content, functions included as annexes, and description of core functions including direction and control, communications, warning, emergency public information, evacuation, mass care, health and medical, and resource management; and (c) hazard-specific appendices containing specific planning considerations unique to a single hazard (Federal Emergency Management Agency, 1996).

Lindell, Perry, and Prater (2007) found that the organization and format of EOPs has historically been left to the discretion of local jurisdictions, yet the federal government is exerting increasing pressure for standardization. Their findings suggest that, because each jurisdiction has its own distinctive combination of hazards, vulnerable populations, resources, organizational structure, and management style, full standardization will be very difficult and will likely take a very long time to realize. They further cite significant inconsistencies in federal guidelines for EOP functional annexes and suggest that local jurisdictions have the authority and flexibility to define their emergency response functions in a way that is most compatible with their specific hazards and within their own specific organizational structure. They conclude that functional annexes must necessarily be a compromise between (a) minimizing the number of annexes to simplify the EOP structure, (b) ensuring that the interrelationships among tasks are clearly identified and that the allocation of resources and performance of tasks are appropriately coordinated, and (c) the development of annexes by each agency or department with emergency response duties defining their specific roles and responsibilities in the emergency response.

One of the basic tenets of our democratic governance model is that local, state, and federal government shares responsibility for protecting citizens from disasters and for helping them to recover when a disaster occurs (Federal Emergency Management Agency, n.d.). Few jurisdictions have the capacity and resources to mitigate a large-scale catastrophe, as evidenced by Hurricane Katrina in 2005, and many community's resources and capabilities can become overwhelmed by even a moderate adverse event. To help mitigate this, state and federal programs have been established to assist local jurisdictions that have been adversely impacted by a catastrophic event. At the federal level, the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) was created in 1988 as an amendment to the Disaster Relief Act of 1974 to support state and local jurisdictions overwhelmed by a disaster (Federal Emergency Management Agency, 2007). This Act authorizes the President to issue "major disaster" or "emergency" declarations upon application by the affected state's Governor either prior or subsequent to the onset of a catastrophic event. The Act further authorizes the President to provide federal resources and financial assistance to the affected state and local jurisdictions (McCarthy, 2007). Once a declaration of emergency or major disaster is made, the Director of FEMA is responsible for immediately initiating appropriate action to assure that federal assistance is provided in accordance with the declaration and applicable laws and regulations (Bazan, 2005). Various forms of federal assistance are available pursuant to a Presidential declaration, including aid to individuals and families, state and local governments, and certain non-profits in rebuilding or replacing damaged infrastructure. Federal assistance can include use of federal agency resources such as personnel, equipment, supplies, facilities, and managerial, technical, and advisory services, as well as allocation of funds from the federal Disaster Relief Fund (DRF). The DRF is funded through an annual appropriation by Congress, and appropriated funds remain available until expended. Supplemental appropriations to the DRF may also be

authorized by Congress as necessary (Bea, 2005). Federal disaster relief funds are allocated through FEMA to provide 75 percent reimbursement of eligible costs, with the state and local agency responsible for the remaining 25 percent (Phillips, 2009).

At the state level, the California Emergency Services Act (CESA) empowers the Governor to proclaim a State of Emergency whenever emergency conditions exceed, or have the potential to exceed, the capability of local resources to control or resolve. The Governor can proclaim a State of Emergency for a specific affected geographic area upon (a) his/her determination that the specific condition(s) articulated in the Act exist; (b) upon formal request by the mayor or chief executive of a city or by the County Administrative Officer or Chairperson of the Board of Supervisors for a county, with concurrent recommendation of the Secretary of the California Emergency Management Agency (Cal-EMA) or (c) his/her determination that the local authority is inadequate to cope with the emergency. A State of Emergency proclamation further authorizes the Governor to exercise expanded emergency powers including (a) exercising police powers as necessary within the designated proclamation area; (b) using and commandeering public and private property and persons to ensure all resources within California are available and dedicated to the emergency when requested; (c) directing all state agencies to utilize and employ personnel, equipment and facilities to prevent or alleviate actual or threatened damage due to the emergency; and (d) making, amending, or rescinding orders and regulations during an emergency, and temporarily suspending any non-safety- related statutes, ordinances, regulations, or rules (California Emergency Management Agency, 2009).

The California Emergency Services Act further authorizes local governing bodies to proclaim a “local emergency” whenever emergency conditions exceed, or have the potential to exceed, the capability of local resources to control or resolve. A declaration of local emergency is generally a prerequisite for a State of Emergency proclamation, however as noted above, the

Governor may proclaim a State of Emergency in certain circumstances without a prior or concurrent local declaration. A local emergency may only be proclaimed by the governing body of a city or county or by an official designated by the governing body by ordinance. Local emergency proclamations are valid as long as necessary; however they must be reviewed by the governing body to establish continued need not less than every 21 days (California Emergency Management Agency, 2009).

The California Disaster Assistance Act (CDAA) authorizes the state to provide financial assistance for costs incurred by local governments as a result of a disaster. CDAA assistance may be authorized in circumstances exceeding the capability of local resources but not sufficient to obtain a Presidential Declaration of Emergency or Declaration of Major Disaster under the Stafford Act. The CDAA further establishes the Disaster Response – Emergency Operations Account in the Special Fund for Economic Uncertainties. Funds for this account are appropriated annually by the state legislature for allocation to eligible state agencies by the state Director of Finance and through the Secretary of Cal-EMA for eligible local jurisdictions. Supplemental appropriations, as necessary, may also be authorized by the state legislature. The CDAA also limits the state's share of eligible costs to 75 percent, except that the state legislature may authorize assistance in excess of 75 percent of total eligible costs if the local agency requesting CDAA assistance is located within a city or county that has adopted a local hazard mitigation plan pursuant to the federal Disaster Mitigation Act of 2000 (California Emergency Management Agency, 2009).

Of all the functions performed after a catastrophic event strikes, perhaps none is more important than damage assessment. Obtaining a clear picture of the nature, scope, and severity of the event is essential to an effective response and eventual recovery (McEntire & Cope, 2004; Suarez, 2006). The American Red Cross (ARC) identifies four levels of damage assessment: (a)

Impact Assessment; (b) Preliminary Damage Assessment (PDA); (c) Area Assessment; and (d) Detailed Damage Assessment (DDA) (American Red Cross, 2003). McEntire (2002) alternatively describes three levels of damage assessment: (a) Rapid (RDA) or Initial Damage Assessment (IDA); (b) Preliminary Damage Assessment; and (c) Technical Damage Assessment.

An ARC Impact Assessment is similar to McEntire's RDA/IDA, and is undertaken immediately following the event to quickly provide information regarding the nature and geographic scope of the event, status of critical infrastructure, and general severity of any resultant damage. This level of assessment is essential early in the response phase to provide critical information to establish strategic response priorities, facilitate effective allocation of available resources, determine eligibility for a local and/or regional emergency declaration, and to provide timely community and media information (American Red Cross, 2003; McEntire, 2002).

An ARC Preliminary Damage Assessment estimates the number of affected buildings by percentage of total buildings within the impact area. The ARC Area Assessment, conducted when a Detailed Damage Assessment is not feasible or timely, describes and outlines the affected area in detail, and also describes the type of damage and the impact within a specific geographic area. It can also be described as a definable area of known damage. The ARC Detailed Damage Assessment (DDA) evaluates building and infrastructure damage in more detail, including an assessment of the number of buildings damaged by type and damage classification. The ARC utilizes five damage classifications to describe building damage as shown in Table 1 (American Red Cross, 2003). FEMA utilizes the same five damage categories with similar criteria as shown in Table 2 (Federal Emergency Management Agency, 2005).

Table 1

ARC Damage Classifications and Criteria

Damage Classification	Flood	<u>Damage Criteria</u>	
		Non-Flood	
Destroyed (D)	>60 in.	Structure totally gone; total collapse; major section(s) of walls missing or collapsed; building shifted on foundation	
Major (MJ)	36 in. – 60 in.	Large section(s) of roof missing; extensive wall damage	
Minor (M)	12 in. – 36 in.	Minor structural damage; broken windows; some roofing/siding damage	
Affected (A)	0 in. – 12 in.	Debris against structure; some roofing material missing; building useable without repairs	
Inaccessible (I)	N/A	N/A	

Table 2

FEMA Damage Classifications and Criteria

Damage Classification	Flood	<u>Damage Criteria</u>	
		Non-Flood	
Destroyed	N/A	Structure completely gone; permanently inhabitable; not economically feasible to repair; complete failure of major structural components (2 or more walls, substantial portion of roof); dwelling pushed off foundations; an unaffected structure that will require removal or demolition.	
Major	12 in. or more on first floor	Significant structural damages sustained including substantial failure of structural elements; uninhabitable; more than 50% damage.	
Minor	12 in. or more in basement	Minor structural damage; temporarily uninhabitable until repairs are completed; less than 50% damage.	
Affected	N/A	Minimal damage to structure and/or contents; habitable without repairs.	
Inaccessible	N/A	Debris against structure; some roofing material missing; building useable without repairs	

McEntire (2002) defines Preliminary Damage Assessment using essentially the same criteria as the ARC Preliminary Damage Assessment (PDA), Area Assessment, and Detailed Damage Assessment (DDA). McEntire and ARC both suggest that a PDA/DDA should be completed as soon as possible. This level of damage assessment is often conducted in cooperation with state and/or federal emergency management officials to establish eligibility for a State of Emergency proclamation or federal Presidential Major Disaster or Emergency Declaration (American Red Cross, 2003; McEntire, 2002).

A Technical Damage Assessment is performed on individual structures and infrastructure to examine the engineering issues associated with these resources in more depth to better evaluate the costs and alternatives associated with any repair, demolition, or reconstruction (McEntire, 2002).

In contrast to the American Red Cross and McEntire's phased damage assessment models, several other emergency management authorities suggest that damage assessment should be a dynamic, continuous process throughout an emergency event (Drabek & Hoetmer, 1991; McDowell & Moore, 2002; McEntire & Cope, 2004). McEntire (2002) and Suarez (2006) further suggest that preparedness activities ultimately determine the effectiveness of damage assessment. Owens (2008) concluded that a pre-event assessment plan, training, pre-determined geographic assessment sectors, communications plan, and adequate staffing to implement the plan are critical elements to effective damage assessment. Loftus (2007) and Myers (2008) concluded that initial and ongoing training is essential to ensure a desired damage assessment outcome.

Although not explicitly mentioned in the Stafford Act, initial and preliminary damage assessments are a critical element in the process of determining if an event warrants a Presidential declaration of major disaster (McCarthy, 2007). The California Emergency Plan requires an Initial Damage Assessment report in addition to the Declaration of Local Emergency

from local jurisdictions when requesting CalEMA concurrence for a Governor's State of Emergency proclamation (California Emergency Management Agency, 2009).

Table 3 lists fifteen "high-level" categories of essential elements of information (EEIs) as identified by the American Red Cross, which represent a comprehensive list of impact-related information necessary to determine what has occurred as a result of a disaster to expedite the decision-making process. The table also includes more specific information required for each category to provide the most valuable intelligence, as well as potential sources to obtain the specific information and suggested products that can be developed from the information for dissemination (American Red Cross, 2008).

Table 3

ARC Essential Elements of Information (EEI)

EEI Category	Specific Information Required	Potential Sources	Products
Boundaries of Disaster Area	<u>All Hazards:</u> <ul style="list-style-type: none"> • Boundaries and geographic locations sustaining damage • Description of extent of damage • Boundaries of areas evacuated • Estimated % of population evacuated • Estimated % of population unable to return • Boundaries of inaccessible areas • Access points to the disaster area • General information as to the terrain/topography of the affected area(s) • Boundaries of the plume areas • Boundaries and/or identified areas where decontamination is required 	<ul style="list-style-type: none"> • Red Cross Chapters • Red Cross staff/volunteers • Local / State government officials • Fire departments • Predictive modeling • Geographic Information Systems (GIS) • Remote sensing/aerial reconnaissance • Assessment teams 	<ul style="list-style-type: none"> • Impact reports • Maps (GIS) • Information for Situation Rep. • Storm track maps • Wind buffer maps • Storm path maps • Earthquake intensity maps • Flood inundation maps • Driving time information reports

Category	Specific Information Required	Potential Sources	Products
Boundaries of Disaster Area	<ul style="list-style-type: none"> • locations where sheltering is required <p><u>Earthquake:</u></p> <ul style="list-style-type: none"> • Area of ground shaking • Area of liquefaction • Landslide/mudslide areas <p><u>Tropical Weather:</u></p> <ul style="list-style-type: none"> • Area of storm surge • Wind buffer areas • Storm track <p><u>Flood:</u></p> <ul style="list-style-type: none"> • Extent and boundaries of flooded areas <p>Inaccessible area boundaries</p> <p><u>Wildland Fire:</u></p> <ul style="list-style-type: none"> • Extent of area burning • Extent of area burned • Smoke plumes/direction <p><u>Tornado:</u></p> <ul style="list-style-type: none"> • Extent of wind damage • Storm path 	<ul style="list-style-type: none"> • FEMA and State Situation Representatives • News media and other open sources • Internet • Post Office • Geographic Positioning System (GPS) • National Weather Service (NWS) • United States Geological Survey (USGS) • National Hurricane Ctr. 	
Socio-Economic / Political Impacts	<ul style="list-style-type: none"> • Number of homes affected • Potential/estimated population affected • Prevalence of basements in affected area • Number and type of businesses/retailers affected • Number of major employers affected • Status of local government operations • Special needs population affected 	<ul style="list-style-type: none"> • Local/state government officials • Fire departments • Predictive modeling • Geographic Information Systems (GIS) • Remote sensing/aerial reconnaissance 	<ul style="list-style-type: none"> • Impact reports • Maps • Information for Situation Reps.

Category	Specific Information Required	Potential Sources	Products
Socio-Economic / Political Impacts		<ul style="list-style-type: none"> • Assessment teams • FEMA /state Situation Reps. • News media/other open sources 	
Jurisdictional Boundaries	<ul style="list-style-type: none"> • List of jurisdictions affected 	<ul style="list-style-type: none"> • Local/state government officials • Local Planning Commissions • Local/County Engineer • Maps • Red Cross Chapters • Post Office 	<ul style="list-style-type: none"> • Maps • Jurisdictional profiles
Status of Transportation	<ul style="list-style-type: none"> • Status of area airports • Status of major highways and roads • Status of primary and secondary roads • Status of bridges • Status of railways • Status of ports • Status of evacuation routes • Status of public transit systems • Status of pipelines • How accessible are the most severely impacted areas? • Is debris a problem on major roadways or bridges • Can feeding crews and outreach teams access the areas? 	<ul style="list-style-type: none"> • FEMA/state Situation Reps. • Local Red Cross Chapter • Local/state government officials • Dept. of Transportation • Public Transit Authority • AAA • School bus companies • Assessment teams • U.S. Army Corps of Engineers 	<ul style="list-style-type: none"> • Maps • Impact reports • Information for Situation Reps.

Category	Specific Information Required	Potential Sources	Products
Status of Transportation		<ul style="list-style-type: none"> • Remote sensing /aerial reconnaissance • Predictive modeling • News media / other open sources 	
Status of Communications	<ul style="list-style-type: none"> • Status of telecommunications services • Areas with disrupted service • Reliability/status of cellular service • Status of TV, radio, cable systems and ability to disseminate information 	<ul style="list-style-type: none"> • Local/state government officials • Local Red Cross Chapters • Assessment teams • FEMA/state Situation Reps. • News media / other open sources 	<ul style="list-style-type: none"> • Impact reports • Information for Situation Reps.
Status of Electrical Power	<ul style="list-style-type: none"> • Status of electrical power generation and distribution systems • Area(s) with disrupted power • Anticipated time for restoration of power • Are pole-to-building services affected? 	<ul style="list-style-type: none"> • Utility companies • Local/state government officials • Local Red Cross Chapter • Assessment teams • FEMA/state Situation Reps. 	<ul style="list-style-type: none"> • Impact reports • Maps • Information for Situation Reps.

Category	Specific Information Required	Potential Sources	Products
Status of Water and Sewer Systems	<ul style="list-style-type: none"> • Status of potable and non-potable water and distribution systems • Status of sewer treatment plants • Area(s) with disrupted service • Anticipated time-frame for service restoration 	<ul style="list-style-type: none"> • Water companies • Local and state government officials • Dept. of Public Works • Health Dept. • FEMA and state Situation Reps. 	<ul style="list-style-type: none"> • Impact reports • Maps • Information for Situation Reps.
Status of Natural Gas Service	<ul style="list-style-type: none"> • Status of gas service • Area(s) with disrupted service • Anticipated time-frame for service restoration 	<ul style="list-style-type: none"> • Gas companies • Local and state government officials • Dept. of Public Works • FEMA and state Situation Reps. 	<ul style="list-style-type: none"> • Impact reports • Maps • Information for Situation Reps.
Status of Critical Facilities	<ul style="list-style-type: none"> • Status of medical facilities • Status of schools / other public buildings • Status of police and fire services • Status of dams and levees 	<ul style="list-style-type: none"> • Local and state government officials • Remote sensing/aerial reconnaissance • Dept. of Public Works • FEMA and state Situation Reps. • Internet • News media/other open sources • National Weather Service • U.S. Geological Survey (USGS) • U.S. Army COE 	<ul style="list-style-type: none"> • Impact reports • Maps • Information for Situation Reps.

Category	Specific Information Required	Potential Sources	Products
Hazard-Specific Information	<u>Examples:</u>		
	<ul style="list-style-type: none"> • Extent of fire • Extent of/potential for flooding • Current river levels compared to flood stage • Estimate of dwellings with basement flooding • Potential for release of HAZMAT • Potential/actual damage to dwellings • Potential for aftershocks • Potential for landslides/mudslides • Location of epicenter • Magnitude of earthquake • Potential for a tsunami • Potential for dam/levee failure • Extent of inland flooding • Extent of storm surge 	<ul style="list-style-type: none"> • Local and state government officials • Local Red Cross Chapters • National Ocean and Atmospheric Administration • Tsunami Warning Center • U.S. Forest Service • National Weather Service • U.S. Geological Survey (USGS) • U.S. Army Corps of Engineers • Pacific Disaster Center • FEMA/state Situation Reps. 	<ul style="list-style-type: none"> • Impact reports • Maps • Information for Situation Reps.
Weather and Environmental Concerns	<u>Weather:</u>		
	<ul style="list-style-type: none"> • Post-event weather forecast • Status/forecast of river levels • Hurricane storm tracks • Storm surge • Evacuation information • Storm paths 	<ul style="list-style-type: none"> • National Weather Service • Red Cross Chapter(s) • River Forecast Center • Media • Internet • HurrEvac • Health Dept. • Government agencies • U.S. Army Corps of Engineers 	<ul style="list-style-type: none"> • Weather reports • Impact reports • Information for Situation Reps. • Maps • Wind buffer maps • Storm track maps • Extreme temperature reports/maps • Environmental concern area maps
	<u>Environmental:</u>		
	<ul style="list-style-type: none"> • Disease / health information • Abnormal quantity of insects/bugs in affected area(s) • Presence of reptiles/rodents • Extreme temperatures • Air quality 		

Category	Specific Information Required	Potential Sources	Products
Weather and Environmental Concerns		<ul style="list-style-type: none"> • Amateur radio warning nets • National Hurricane Center • Central Pacific Hurricane Center • Joint Typhoon Warning Center 	
Historical Information	<ul style="list-style-type: none"> • Have previous similar events affected the area? • What were the results? • What were the critical issues? • Have any mitigation activities taken place since last event? • What type? • What were the community needs? 	<ul style="list-style-type: none"> • Red Cross Chapter(s) • Local/state government officials • After action reports • Situation reports • Other archived information • FEMA/state Emergency Management Agency 	<ul style="list-style-type: none"> • Impact reports • Maps • Information for Situation Reps.
Demographics	<ul style="list-style-type: none"> • Population of impacted areas • Demographic breakdown of population including income levels • Number/type of housing units in impacted area(s) • Prevalence of basements • Level and prevalence of insurance coverage 	<ul style="list-style-type: none"> • Dept. of Census (GIS) • Predictive modeling • Commercial products • Internet • Red Cross Chapter(s) • Local/state government officials • Local insurance agencies 	<ul style="list-style-type: none"> • Impact reports • Maps • Information for Situation Reps.

Category	Specific Information Required	Potential Sources	Products
Hazardous, Toxic, and Radiological Issues	<ul style="list-style-type: none"> • Are there suspected or reported hazardous material/toxic release incidents? Where? • Are there actual or potential radiological issues? Where? 	<ul style="list-style-type: none"> • Local/State government officials • FEMA/state Situation Reps. • Health Depts. • Nuclear Regulatory Commission • Local Emergency Planning Committee • Remote sensing • Predictive modeling 	<ul style="list-style-type: none"> • Impact reports • Maps • Information for Situation Reps.
Status of Emergency Operations Centers	<ul style="list-style-type: none"> • Status of local Emergency Operations Centers (EOCs) • Status of state EOC Has a Disaster Field Office (DFO) been established? 	<ul style="list-style-type: none"> • Government Liaison • Local/state government officials • FEMA offices 	<ul style="list-style-type: none"> • Impact reports • Information for Situation Reps.

Many jurisdictions refer to Initial Damage Assessment (IDA) or Rapid Damage Assessment (RDA) as a “windshield assessment” conducted by ground vehicle to expedite the assessment process (Boyd, 2008; Chandler, 2008; Owens, 2008; Suarez, 2006). Suarez (2006) further suggests that aerial reconnaissance may be an effective IDA/RDA tool for some communities. Technology can also enhance damage assessment efforts, such as GIS/GPS-based mapping tools (Myers, 2008).

Some researchers also suggest that IDA/RDA procedures should include an assessment of the status of emergency services as an initial priority (Boyd, 2008; Kellen, 2008). Boyd

(2008), Ganz (1998), and Owens (2008) reported that IDA/RDA should also include an assessment of a community's critical facilities and infrastructure.

Many jurisdictions assign responsibility for initial damage assessment, regardless of format, to first responder personnel. Myers (2008) reported that 60 percent of the jurisdictions he surveyed assign initial damage assessment responsibility to the fire department. Similar findings were reported by Boyd (2008), Chandler (2008), and Peterson (2005). Thirty-five percent of the jurisdictions surveyed by Owens (2008) assign damage assessment to the Building Department, while damage assessment in other jurisdictions is a joint responsibility of multiple disciplines/departments (Giomi, 2002; Myers, 2008; Owens, 2008). Some jurisdictions also assign damage assessment, either wholly or in partnership with paid staff, to civilian Community Emergency Response Teams (CERT) (Cole & Ferguson, 1993; Loftus, 2007; Myers, 2008; TeKippe, 2003) while other communities rely solely on CERT and other private sector resources for disaster damage assessment (Johnson, 2002).

TeKippe (2003) reported 43 percent of the agencies he surveyed targeted completion of an IDA/RDA within the first hour following the onset of a disaster, while Lenexa, Kansas established 12-24 hours (Owens, 2008) and Springfield, Oregon's plan targets 24 hours as the desired time frame (Kellen, 2008). Many communities incorporate pre-designated survey areas or zones in their IDA/RDA plans and procedures, including 54 percent of the agencies surveyed by Chandler (2008), 40 percent surveyed by Loftus (2007), and 48 percent surveyed by Owens (2008). Myers (2008) and Owens (2008) also found that 80 percent of the agencies surveyed utilized a standard format/worksheet for damage assessment. Windham (2008) concluded that five or fewer damage categories enhance efficiency of damage assessment, and also found that most agencies surveyed utilize the ARC/FEMA damage categories and criteria. Essential Elements of Information (EIs) for damage assessment vary widely, and appear to be linked

largely to a community's disaster history and frequency, level of detail of the damage assessment plan/procedure, and time expectation for completion of the IDA/RDA. Most plans incorporate at least some of the EEIs recommended by the American Red Cross (Holcombe, 2001).

In summary, the literature reviewed identifies four common interrelated principles of emergency management: mitigation, planning, response, and recovery. Effective emergency management requires that these principles are effectively integrated through a comprehensive process in order to minimize the impacts of an adverse event. This process includes the development and implementation of specific pre-event plans that trigger specific actions when initiated. The literature reviewed further suggests that effective emergency management also emphasizes the need for comprehensive, risk-based, all hazard emergency operations plans to establish responsibilities and lines of authority to ensure an appropriate and coordinated response to an emergency event. While the organization and format of emergency operations plans have historically been left to the discretion of local jurisdictions, the federal government has been exerting increasing pressure for standardization, and FEMA has developed specific EOP guidelines including a functional annex element incorporating separate sections addressing specific emergency management functions such as damage assessment.

Damage assessment is essential to an effective response and eventual recovery from any large-scale event. The American Red Cross and other emergency management authorities identify and define specific damage assessments for the different phases of an emergency or disaster while other emergency management professionals suggest that damage assessment should be a dynamic, continuous process throughout the duration of an event from onset through recovery. The literature supports an initial damage assessment as essential to quickly provide critical information to establish strategic response priorities, facilitate effective allocation of

available resources, and to provide timely community and media information. State and federal disaster assistance is often predicated on completion of a prescribed damage assessment.

Effective initial and/or rapid damage assessment plans and/or procedures include a specific time frame for completion, assigned responsibility, pre-designated survey areas or zones, and specific elements of information to be reported, including an assessment of emergency services and critical facilities and infrastructure, and general extent of damage by classification. Technology can enhance the accuracy and speed of damage assessment, and initial and recurrent training is also considered essential to ensure effective damage assessment.

Procedures

Guidelines from the literature review were used to answer research questions (a): “what standards or guidelines exist relative to disaster damage assessment,” and (b): “what criteria and/or procedures are utilized by other communities to evaluate damage subsequent to an adverse event?” Disaster management and disaster damage assessment-related literature was reviewed specifically to identify any mandated or generally accepted standards or practices relative to disaster damage assessment. The literature was further reviewed to identify specific damage assessment criteria and/or procedures employed by jurisdictions of similar size and risk potential as Monterey.

Research questions (c): “what are the most appropriate initial damage assessment criteria and procedures for Monterey,” and (d): “how is this information best formatted, communicated, and maintained to assure maximal value and effective utilization” were answered using a combination of structured interviews and guidelines from the literature review. Six senior City management executives with collateral Emergency Operations Center assignments involving

damage assessment were interviewed to determine their preferred criteria and procedures for initial damage assessment. Interview participant's EOC assignments included Deputy Director of Emergency Services (EOC Manager), Operations Section Coordinator, Planning and Intelligence Section Coordinator, alternate Planning and Intelligence Section Coordinator, Situation Unit Leader, and alternate Situation Unit Leader. This sample population was selected as the EOC staff positions either directly responsible for or most reliant on damage assessment data during the initial stages of an emergency event, both from the data collection and analysis perspective (Planning and Intelligence Section staff) and the strategic operational perspective (Deputy Director of Emergency Services and Operations Section Coordinator).

Interview participants were asked the following seven questions in an open response format with follow-up questions as necessary to provide for clarification of a response: (a) what specific elements of information do you desire from an initial damage assessment; (b) considering the expected initial confusion and competing priorities associated with the onset of a large-scale disaster, which city staff or other person(s) or group(s) are best suited from your perspective to have responsibility for conducting initial damage assessment; (c) what is your desired time frame for completion of initial damage assessment following the event onset in order to best meet EOC response planning objectives; (d) how should IDA resources be notified for deployment to best assure completion of the IDA within the desired time frame; (e) should the IDA procedures include pre-designated survey areas, and if so, how should they be established; (f) what are your strategic goals for the IDA process; and (g) what format do you prefer or recommend to best assure effective utilization, communication, and maintenance of the IDA plan?

When contacted to schedule interview date and time, four of the six interview participants expressed a complete lack of familiarity with damage assessment. Because of this, and to

facilitate validity of interview results, a copy of the literature review section of this research project was provided to each participant as background information prior to the interviews. Interviews were conducted between 8:00 a.m. and 9:00 a.m. in a private office to minimize external noise variables. This interview time was specifically selected at the beginning of the participant's regular work day to minimize any distractions associated with the participant's other work responsibilities. Interview responses were manually transcribed by the researcher.

Findings from the structured interviews, combined with guidelines derived from the literature review relative to specific damage assessment criteria and/or procedures employed by jurisdictions of similar size and risk potential as Monterey, were used to develop a draft Initial Damage Assessment (IDA) Plan. The draft Plan was formatted as a functional annex to the City Emergency Operations Plan (EOP) to include the following elements: (a) damage assessment goals, strategies, and priorities; (b) direction, control, and coordination of damage assessment resources; (c) damage assessment survey zones; (d) responsibility for conducting initial damage assessment; (e) notification and deployment procedures; (f) damage classifications and related criteria; (g) specific elements of damage information; (h) communications; and (i) personnel safety and accountability. The draft Plan included maps of pre-designated damage assessment survey zones with locations of critical infrastructure and key resources (CIKR) identified by category. An IDA survey zone worksheet for use by the pre-designated damage assessment survey zone teams and an IDA summary worksheet to assist the EOC Planning/Intelligence Section in compiling the assessment survey results were also included.

The draft IDA plan was subjected to stakeholder review by the Monterey City Disaster Council, Monterey City CERT Advisory Committee, Plans Officer for the Presidio of Monterey Directorate of Plans, Training, Mobilization, and Security (DPTMS), and the Naval Postgraduate School Emergency Planning Officer. These individuals and groups were selected for review as

representative City emergency management stakeholders who have specific responsibilities within the Plan and/or final Plan approval authority. The final Initial Damage Assessment Plan (Appendix A) was transmitted to the City Disaster Council for endorsement and approval for incorporation into the City's Emergency Operations Plan and annual emergency management training plan.

This research project is limited in scope to initial damage assessment only, and does not consider any criteria or procedures for any subsequent damage assessment that may be conducted pursuant to an adverse event.

Results

For research question (a): "what standards or guidelines exist relative to disaster damage assessment," the American Red Cross (ARC) has developed the most comprehensive guidelines available within their disaster response phase-specific guidelines and procedures. Other damage assessment guidelines developed by the Federal Emergency Management Agency (FEMA) and other independent researchers and emergency management professionals incorporate essentially some or most of the same criteria as the ARC such as (a) management of damage assessment efforts; (b) coordination of resources; (c) differential levels of damage assessment; (d) data collection; (e) essential elements of damage information; (f) damage categories and criteria; (g) data processing and analysis; and (h) damage assessment worksheets. In California, an Initial Damage Assessment is required from local jurisdictions in order to receive state disaster assistance pursuant to a Governor's State of Emergency proclamation. Although not specifically required by the Stafford Act to receive federal disaster assistance, initial and preliminary damage

assessments are considered critical elements of the decision process is determining whether an event warrants a Presidential Declaration of Emergency or Major Disaster.

For research question (b): “what criteria/procedures are utilized by other communities to evaluate damage subsequent to an adverse event,” effective damage assessment plans and procedures commonly include the following elements: (a) specific pre-assigned responsibility for conducting damage assessment; (b) specific time frame for completion of damage assessment; (c) pre-designated damage assessment survey areas or zones; (d) specific desired elements of damage information; (e) communications; and (f) initial and recurrent training.

For research question (c): “what are the most appropriate initial damage assessment criteria and procedures for Monterey,” results of the structured interviews are summarized in Tables 4 – 9:

Table 4

Interview Results – Question #1: “what specific elements of information do you desire from an initial damage assessment?”

Participant Number	Response
1	<ol style="list-style-type: none"> 1. Location of damage 2. Extent of damage 3. Is the area safe for first responders
2	<ol style="list-style-type: none"> 1. Life safety exposures 2. Damage to critical infrastructure 3. Damage to public/private property
3	<ol style="list-style-type: none"> 1. Immediate life safety issues 2. Critical infrastructure failure(s)
4	<ol style="list-style-type: none"> 1. How big is the event 2. what areas sustained damage 3. How bad is the damage
5	<ol style="list-style-type: none"> 1. Area impacted by the disaster 2. Immediate life safety concerns 3. Impacts to critical infrastructure 4. Damage to private property
6	<ol style="list-style-type: none"> 1. Loss of life 2. Damage to public safety resources 3. Damage to medical facilities 4. Damage to transportation resources 5. Damage to major utilities 6. Damage to places of public assembly 7. Damage to private property

Table 5

Interview Results – Question #2: “considering the expected initial confusion and competing priorities associated with the onset of a large-scale disaster, which city staff or other person(s) or group(s) are best suited from your perspective to have responsibility for conducting initial damage assessment?”

Participant Number	Response
1	<ol style="list-style-type: none"> 1. CERT-trained volunteers 2. Non public safety staff 3. Outside agency support staff
2	<ol style="list-style-type: none"> 1. Trained civilian volunteers (e.g. CERT) 2. City Building Inspectors / Engineers 3. City public safety personnel
3	<ol style="list-style-type: none"> 1. Public safety employees 2. CERT teams 3. Trained personnel from outside the City
4	<ol style="list-style-type: none"> 1. Building inspectors 2. Volunteers
5	<ol style="list-style-type: none"> 1. CERT teams 2. Non public safety City staff available within 30 minutes 2. Outside agency staff (e.g. POM, NPS)
6	<ol style="list-style-type: none"> 1. Building / Public Works inspectors 2. Civil engineers 3. City planners 4. Certain public safety employees

Table 6

Interview Results – Question #3: “what is your desired time frame for completion of initial damage assessment following the event onset to best meet EOC response planning objectives?”

Participant Number	Response
1	As soon as possible, preferably within an hour or two
2	As soon as practical
3	As soon as possible (2-3 hours)
4	8 hours
5	1 hour
6	1-2 hours

Table 7

Interview Results – Question #4: “how should IDA resources be notified for deployment to best assure completion of the IDA within the desired time frame?”

Participant Number	Response
1	Notification should be made utilizing the County –wide Telephone Emergency Notification System (TENS)
2	Multiple redundant tools should be available for notification including a mass notification system such as the City’s E-Sponder program, as well as a telephone tree and self-deployment systems
3	Multiple means of concurrent notification, such as telephone, cell phone, e-mail, internet, AM radio
4	Using a reverse 9-1-1 telephone system
5	Multiple concurrent modes of notification including landline telephone, cellular telephone, e-mail, text messaging, pager, website, radio, etc.
6	By whatever means are available at the time to ensure positive contact

Table 8

Interview Results – Question #5: “should the IDA procedures include pre-designated survey areas, and if so, how should they be established?”

Participant Number	Response
1	Yes, the plan should include pre-designated survey areas established so they are not too large and are easily accessed
2	Yes, pre-designated zones should be established, probably by neighborhood or business district; police beats or fire response areas could also be used but would likely be too large to generate meaningful information within the desired time frame
3	Pre-designated zones would be helpful to ensure that the City is adequately covered within the time allotted
4	Pre-designated survey areas are probably a good idea; not sure how to establish them
5	Pre-designated survey areas are essential to ensure completion of initial damage assessment within the first hour; suggest using the existing designated neighborhood districts
6	Pre-designated survey areas should absolutely be established using currently-defined geographic areas based on existing neighborhood and business districts; do not create survey zones that would only be used for disasters

Table 9

Interview Results – Question #6: “what are your strategic goals for the IDA process?”

Participant Number	Response
1	<ol style="list-style-type: none"> 1. Determine extent of event impacts 2. Determine injuries/deaths 3. Determine ability to safely conduct an expanded assessment
2	To get enough information to determine the nature and magnitude of the event, make appropriate decisions about where to focus resources, develop action plans, inform the public, request additional resources, report to State office of Emergency Services and others as required; presuming the initial damage assessment is conducted largely by volunteers, it should also generate enough information to determine where to focus the City’s paid and mutual aid resources for additional assessment
3	<ol style="list-style-type: none"> 1. Life safety 2. Response capacity 3. Impacts to critical infrastructure
4	<ol style="list-style-type: none"> 1. Determining the extent of damage 2. Determining injuries/deaths
5	<ol style="list-style-type: none"> 1. Status of emergency response resources 2. Status of critical infrastructure 3. Immediate life safety concerns 4. Determining scope and extent of damage
6	To get an overall picture of the stability of the community and begin to develop a response action plan

For research question (d): “how is this information best formatted, communicated, and maintained to assure maximal value and effective utilization,” results of the structured interviews are summarized in Table 10 below:

Table 10

Interview Results – Question #7: “what format do you prefer or recommend to best assure effective utilization, communication, and maintenance of the IDA plan?”

Participant Number	Response
1	No preference; I don’t have enough experience or exposure to this to make a recommendation
2	Prefer an electronic format that can be readily accessed by the EOC staff and other authorized persons through our internet-based E-Sponder emergency management program
3	No preference for format although it should include visual aids such as maps with critical infrastructure locations
4	No recommendation; I don’t have sufficient knowledge of this subject to render an opinion
5	Recommend that the IDA Plan be incorporated into the City Emergency Operations Plan and be made available electronically through the City’s E-Sponder program
6	No specific format preferred although it should be clear, concise, and readily accessible in the event of an emergency

Guidelines from the literature reviewed suggest incorporating damage assessment information into a community’s GIS database and/or into a comprehensive community Emergency Operations Plan as effective solutions to ensuring that the information is readily available and accessible to emergency management personnel when needed. These solutions also help ensure currency, accuracy, and reliability of the information, particularly if the community’s EOP process includes regular review and validation.

Findings from the structured interviews, in conjunction with guidelines derived from the literature review, were utilized to develop a draft Initial Damage Assessment Plan. The draft Plan was subjected to stakeholder review by the following four key emergency management

stakeholder individuals and groups: (a) the Monterey City Disaster Council, (b) the Monterey City CERT Advisory Committee, (c) the Plans Officer for the Presidio of Monterey Directorate of Plans, Training, Mobilization, and Security (DPTMS), and (d) the Naval Postgraduate School Emergency Planning Officer. Nine stakeholder responses were received and subsequently incorporated into the final IDA Plan to the extent they did not conflict with other recommendations or with any of the key plan objectives. The final IDA Plan (Appendix A) was presented to and formally adopted by the City Disaster Council and approved for incorporation into the City's comprehensive Emergency Operations Plan as a functional annex. The City Disaster Council further endorsed incorporating the IDA Plan into the City's annual emergency preparedness and management training plan.

Discussion

The results for research question (a): "what standards or guidelines exist relative to disaster damage assessment," indicate that although an initial or preliminary damage assessment is not specifically articulated as a requirement of the Robert T. Stafford Disaster Relief and Emergency Assistance Act as a prerequisite to receiving federal disaster assistance, it is however considered critical elements of the decision process in determining whether an event warrants a Presidential Declaration of Emergency or Major Disaster, which is a necessary prerequisite to receiving federal aid (Federal Emergency Management Agency, 2007). Because of this, an initial or preliminary damage assessment is essentially a de facto requirement for local jurisdictions to receive federal disaster assistance. Additionally in California, an Initial Damage Assessment is required from local jurisdictions as a condition of a request for a Governor's State of Emergency proclamation in order to receive state disaster assistance (California Emergency

Management Agency, 2009). In addition to facilitating establishment of strategic response priorities and allocation of available resources, these requirements for damage assessment as a qualifying condition for state and federal disaster assistance make it imperative that local jurisdictions have effective damage assessment plans and procedures in place prior to the onset of any adverse event that has the potential to overwhelm the local jurisdiction's ability to mitigate the event without outside assistance.

Damage Assessment guidelines and procedures developed by the American Red Cross are arguably the most comprehensive available, although other damage assessment guidelines developed by the Federal Emergency Management Agency (FEMA) and other independent researchers and emergency management professionals incorporate many of the same criteria including: (a) management of damage assessment efforts; (b) coordination; (c) differential levels of damage assessment; (d) data collection; (e) essential elements of damage information; (f) damage categories and criteria; (g) data processing and analysis; and (h) damage assessment worksheets (American Red Cross, 2003; Federal Emergency Management Agency, 2005; McCarthy, 2007; McEntire, 2002). These criteria should be considered as integral elements of any comprehensive damage assessment process, and were incorporated into the Monterey Initial Damage Assessment Plan referenced below.

The results for research question (b): "what criteria/procedures are utilized by other communities to evaluate damage subsequent to an adverse event," indicate the following elements are common to effective damage assessment plans and procedures: (a) specific pre-assigned responsibility for conducting damage assessment; (b) specific time frame for completion of initial damage assessment; (c) pre-designated damage assessment survey areas or zones; (d) specific desired elements of damage information; (e) communications; and (f) initial and recurrent training. These results are consistent with American Red Cross guidelines

(American Red Cross, 2008), and further support McEntire's (2002) and Suarez's (2006) findings that pre-event assessment plans, training, pre-determined geographic assessment sectors, communications, and adequate staffing to implement the plan are critical elements to effective damage assessment. The results identifying pre-designated responsibility for conducting the damage assessment also support the findings of Boyd (2008), Chandler (2008), Giomi (2002), Myers (2008), and Peterson (2005). These criteria and procedures were also incorporated into the Monterey Initial Damage Assessment Plan referenced below.

Findings from the structured interviews along with guidelines derived from the literature reviewed were used to answer research question (c): "what are the most appropriate initial damage assessment criteria and procedures for Monterey?" When contacted by the researcher to schedule interview date and time, a majority of the interview participants expressed a lack of understanding and experience regarding disaster damage assessment. This was somewhat surprising since all City EOC staff have recently completed mandated Department of Homeland Security National Response Framework, National Incident Management System (NIMS) and EOC position-specific training, although the current City Disaster Plan does not address damage assessment and none of the current City EOC staff could recall a formal damage assessment process ever being implemented. As a result of this lack of understanding and to facilitate valid interview results, a copy of the literature review section of this research project was provided to each participant as background information prior to the interviews. Even with this background information, interview responses reflected a relatively low level of comprehension of the role of damage assessment in the effective management of and recovery from large-scale disaster events.

The results from interview question #1: "what specific elements of damage information do you desire from an initial damage assessment" indicate that (a) defining the area sustaining

damage, and (b) life safety, critical infrastructure, and general public and private property impacts are the most important elements desired. These results are consistent with findings reported by Holcombe (2001), however they are considerably less specific than those elements of information defined by the American Red Cross (American Red Cross, 2008) and other researchers and disaster management authorities (Boyd, 2008; Kellen, 2008).

The results from interview question #2: “considering the expected initial confusion and competing priorities associated with the onset of a large-scale disaster, which city staff or other person(s) or group(s) are best suited from your perspective to have responsibility for conducting initial damage assessment,” indicate that CERT-trained civilian volunteers are preferred, followed by non-public safety City employees, City public safety personnel, other volunteers, and staff from outside public agencies or jurisdictions. The use of civilian CERT volunteers for initial damage assessment is consistent with the findings of Cole and Ferguson (1993), Johnson (2002), Loftus (2007), and Myers (2008), while the use of public safety personnel is supported by Boyd’s (2008), Chandler’s (2008), and Peterson’s (2005) research. The use of non-public safety staff is also consistent with the findings reported by Giomi (2002), Myers (2008), and Owens (2008). For Monterey, the use of other than on-duty public safety personnel to conduct initial damage assessment is most preferred in order to preserve those limited resources for other initial response mitigation priorities.

The results from interview question #3: “what is your desired time frame for completion of initial damage assessment following the event onset in order to best meet EOC response planning objectives,” were inconsistent, ranging from “as soon as practical” to a more concrete time frame of one to eight hours, with a majority of the participants’ responses focused in the 1-2 hour range. This is consistent with TeKippe’s (2003) findings that 43 percent of the agencies he surveyed targeted completion of initial damage assessment with the first hour; however it

contradicts the significantly longer 12-24 hours time frame reported by Kellen (2008) and Owens (2008). Results indicating a shorter desired time frame for Monterey were based on the respondent's emergency management priority to develop appropriate strategic response objectives and priorities and optimize allocation of the scarce initial response resources as quickly as possible.

The results from interview question #4: "how should IDA resources be notified for deployment to best assure completion of the IDA within the desired time frame," indicate a mass notification system as the preferred tool. Several participants suggested multiple concurrent modes of notification to increase probability of successful notification, particularly if primary communications systems are adversely impacted by the event. None of the literature reviewed for this project specifically addressed the notification and deployment elements of damage assessment. The City of Monterey has two mass notification tools available for use with multiple notification modes, including a county-wide telephone emergency notification system and the alerting component of the City's emergency management software package.

The results for interview question #5: "should the IDA procedures include pre-designated survey areas, and if so, how should they be established," were unanimous in recommending pre-designated damage survey areas. These results are consistent with the findings reported by Chandler (2008), Loftus (2007, and Owens (2008). The results further indicated a preference for utilizing existing defined neighborhood and business districts, which encompass approximately 75 percent of the City's geographic area.

The results for interview question #6: "what are your strategic goals for the IDA process," were relatively consistent and perhaps best articulated by Participant #2 "to get enough information to determine the nature and magnitude of the event, make appropriate decisions about where to focus resources, develop action plans, inform the public, request

additional resources, report to State office of Emergency Services and others as required; presuming the initial damage assessment is conducted largely by volunteers, it should also generate enough information to determine where to focus the City's paid and mutual aid resources for additional assessment." These results are consistent with American Red Cross guidelines identifying multiple management and service delivery objectives (American Red Cross, 2003), and also with McEntire's (2002) conclusion that obtaining a picture of the nature and extent of the event and understanding the degree of damage is essential for a successful response and long-term recovery.

The results for interview question #7: "what format do you prefer or recommend to best assure effective utilization, communication, and maintenance of the IDA plan," were inconsistent with a majority of the participants indicating no preference or recommendation. Minority responses suggest an electronic format readily accessible by all EOC staff personnel, with one respondent recommending that it be incorporated into the City's Emergency Operations Plan. This minority recommendation is consistent with Garling's (2007), Gordon's (2002) and Lindell, Perry, & Prater's (2007) findings that incorporation of this type of information into a community's GIS database and/or into a comprehensive Emergency Operations Plan are effective solutions to ensure that the information is readily available and accessible to emergency management personnel when needed. For Monterey, like most other jurisdictions, multiple copy paper plans have historically proven less effective than a single electronic version that can be readily updated and accessed as needed.

Findings from the structured interviews along with guidelines derived from the literature reviewed were used to develop a draft Initial Damage Assessment Plan. This comprehensive IDA Plan was formatted consistent with other City Emergency Operations Plan Annexes to include the following elements: (a) introduction; (b) purpose and scope; (c) definitions; (d)

assumptions and planning principles; (e) damage assessment concept of operations; (f) synopsis of goals, strategies, and priorities; (g) direction, control, and coordination; (h) damage assessment survey zones; (i) responsibility for conducting initial damage assessment; (j) notification and deployment; (k) damage assessment response procedures; (l) damage classifications and criteria; (m) critical elements of information; (n) communications guidelines; (o) personnel safety and accountability; (p) plan development and maintenance; (q) after action reports and corrective actions; and (r) authorities and references. The draft Plan also incorporates maps of the pre-designated damage assessment survey areas including critical city infrastructure and key resource locations by category. The Plan further incorporates an IDA survey zone worksheet for use by each individual pre-designated damage assessment survey area team, and an IDA summary worksheet to assist the EOC Planning/Intelligence Section in compiling the assessment survey results.

The draft IDA Plan was subjected to stakeholder review as described in the procedures and results sections of this research project. Nine minor comments were received that were subsequently incorporated into the final IDA Plan to the extent they did not conflict with other recommendations or with the any of the key plan objectives. The final IDA Plan (Appendix A) was presented to and formally adopted by the City Disaster Council and approved for incorporation into the City's comprehensive Emergency Operations Plan as a functional annex. The City Disaster Council further endorsed incorporating the IDA Plan into the City's annual emergency preparedness and management training plan.

Recommendations

Future researchers may wish to consider developing criteria and procedures for a more dynamic, continuous damage assessment process that occurs throughout an emergency event and beyond the initial response phase as recommended by Drabek & Hoetmer (1991), McDowell & Moore (2002), and McEntire & Cope (2004).

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